

What is claimed is:

1. A method of inspecting a copy for defects of interest, comprising the steps of:
 - a) providing an image signal containing a region of interest of the copy;
 - b) transforming said image signal by a plurality of transform functions so as to obtain a plurality of conditioned image signals;
 - c) extracting a plurality of residual defect signals using said plurality of conditioned image signals to determine the presence of defects of interest, wherein each residual defect signal of said plurality of residual defect signals corresponds to a respective one of said plurality of conditioned image signals; and
 - d) performing a rule-based analysis on said plurality of residual defect signals.
2. A method according to claim 1, wherein step c) includes:
 - e) providing a data signal containing said region of interest of a standard; and
 - f) extracting each residual defect signal of said plurality of residual defect signals using a corresponding one of said plurality of first conditioned images and said data signal.
3. A method according to claim 2, wherein step f) includes:
 - g) transforming said data signal by said plurality of transform functions so as to obtain a plurality of conditioned data signals; and
 - h) extracting each residual defect signal of said plurality of defect signals using corresponding respective ones of said plurality of conditioned data signals and said plurality of conditioned image signals.
4. A method according to claim 3, wherein step h) comprises the step of subtracting each one of said plurality of conditioned image signals from a corresponding respective one of said plurality of conditioned data signals so as to obtain corresponding ones of said plurality of residual defect signals.
5. A method according to claim 3, wherein the copy includes at least one defined structure, at least one absence of said at least one defined structure and at least one edge of said at least one defined structure and the defects of interest include defects within said at least one defined structure, defects within said at least one absence and defects on said at least one edge.

6. A method according to claim 5, wherein said plurality of transforms comprises a first transform that enhances the defects of interest within said at least one defined structure, a second transform that enhances the defects of interest within said at least one absence and a third transform that enhances the defects of interest on said at least one edge.
7. A method according to claim 1, further comprising prior to step b) the step of preconditioning said image signal.
8. A method according to claim 7, wherein the step of preconditioning said image signal includes applying geometric corrections to said image signal.
9. A method according to claim 7, wherein the step of preconditioning said image signal includes applying photometric corrections to said image signal.
10. A method according to claim 3, further comprising prior to step g) the step of preconditioning said data signal.
11. A method according to claim 10, wherein the step of preconditioning said image signal includes performing a morphology.
12. A method according to claim 1, wherein said data signal contains at least a portion of a CAD file.
13. A method according to claim 1, wherein said data signal contains at least a portion of a golden image.
14. A method according to claim 1, wherein the copy includes at least one defined structure, at least one absence of said at least one defined structure and at least one edge of said at least one defined structure and the defects of interest include defects within said at least one defined structure, defects within said at least one absence and defects on said at least one edge.
15. A method according to claim 14, wherein said plurality of transforms comprises a first transform that enhances the defects of interest within said at least one defined structure, a second transform that enhances the defects of interest within said at least one absence and a third transform that enhances the defects of interest on said at least one edge.

16. A method according to claim 1, wherein said rule-based analysis includes the steps of determining the location of each one of the defects of interest relative to at least one structure of interest within said region of interest and reporting at least some of the defects of interest based upon their locations.
17. A method according to claim 1, wherein said rule-based analysis includes the step of determining whether each of the defects of interest is present in more than one of said plurality of residual defect signals.
18. A method according to claim 17, wherein said rule-based analysis includes the step of reporting only ones of the defects of interest present in more than one of said plurality of residual defect signals.
19. A method according to claim 1, wherein said rule-based analysis includes the step of determining the location of each of the defects of interest relative to one of a defined structure, an absence of said defined structure and an edge of said defined structure.
20. A method according to claim 19, wherein said rule-based analysis includes the steps of determining whether or not a defect of interest is exclusively within a defined structure, exclusively outside of said defined structure, or on an edge of said defined structure.
21. A method of inspecting a copy for defects of interest, comprising the steps of:
 - a) providing an image signal containing a region of interest of the copy;
 - b) providing a data signal containing said region of interest of a standard;
 - c) transforming said image signal by a plurality of transform functions so as to obtain a plurality of conditioned image signals;
 - d) transforming said data signal by said plurality of transform functions so as to obtain a plurality of conditioned data signals; and
 - e) extracting each residual defect signal of said plurality of defect signals using corresponding respective ones of said plurality of conditioned data signals and said plurality of conditioned image signals.
22. A method according to claim 21, further comprising the step of performing a rule-based analysis of said plurality of residual defect signals so as to report at least some of the defects of interest.

23. A method according to claim 22, wherein said rule-based analysis includes the steps of determining the location of each one of the defects of interest relative to at least one structure of interest within said region of interest and reporting at least some of the defects of interest based upon their locations.
24. A method according to claim 22, wherein said rule-based analysis includes the step of determining whether each of the defects of interest is present in more than one of said plurality of residual defect signals.
25. A method according to claim 24, wherein said rule-based analysis includes the step of reporting only ones of the defects of interest present in more than one of said plurality of residual defect signals.
26. A method according to claim 22, wherein said rule-based analysis includes the step of determining the location of each of the defects of interest relative to one of a defined structure, an absence of said defined structure and an edge of said defined structure.
27. A method according to claim 26, wherein said rule-based analysis includes the steps of determining whether or not a defect of interest is exclusively within a defined structure, exclusively inside an absence of a defined structure or on an edge of a defined structure.
28. A system for inspecting a copy for defects of interest, wherein the copy corresponds to a standard, the system comprising:
 - a) a first means for extracting a plurality of residual defect signals from a region of interest using the copy and the standard; and
 - d) a second means for performing a rule-based analysis on said plurality of residual defect signals so as to report at least some of the defects of interest.
29. A system according to claim 28, wherein said first means includes a third means for transforming an image file containing a region of interest of the copy by a plurality of transforms to create a plurality of conditioned image files.
30. A system according to claim 29, wherein said first means includes a fourth means for transforming a data file containing said region of interest of the standard by said plurality of transforms to create a plurality of conditioned data files.

31. A system according to claim 30, wherein said first means includes a fifth means for aligning and subtracting corresponding respective ones of said plurality of conditioned image files and said plurality of data files.
32. A system according to claim 28, wherein said second means includes a sixth means for determining the location of each one of the defects of interest relative to at least one structure of interest within said region of interest and reporting at least some of the defects of interest based upon their locations.
33. A system according to claim 28, wherein said second means includes a seventh means for determining whether each of the defects of interest is present in more than one of said plurality of residual defect signals.
34. A system according to claim 24, wherein said second means includes an eighth means for reporting only ones of the defects of interest present in more than one of said plurality of residual defect signals.
35. A system according to claim 22, wherein said second means includes a ninth means for determining the location of each of the defects of interest relative to one of a defined structure, an absence of said defined structure and an edge of said defined structure.
36. A system according to claim 26, wherein said ninth means further determines whether or not a defect of interest is exclusively within a defined structure, exclusively inside an absence of a defined structure or on an edge of a defined structure.
37. A defect detection and classification system for inspecting items for defects of a plurality of defect types, the system comprising:
 - a) a defect detection device operatively configured to perform a plurality of analyses of a region of interest and provide at least one signal representing each type of defect, each of said plurality of analyses operating to enhance at least one of the plurality of defect types; and
 - b) a rule-based logic system in communication with said defect detection device and operatively configured to receive and process said plurality of signals and for classifying defects within said region of interest, wherein each of said plurality of signals is

compared to the others of said plurality of signals and is associated to one or more of said plurality of signals having characteristics similar to that one of said plurality of signals.

38. A defect detection and classification system according to claim 37, wherein the item is selected from the group consisting of artworks, reticles, photomasks and production parts of electronic, semiconductor, display, micro-electromechanical system, hard disk and nanotechnology processes.
39. A defect detection and classification system according to claim 37, further comprising a detector operatively connected to said defect detection device.
40. A method for constructing a rule-based logic defect detection and classification system for inspection of artworks, reticles, photomasks and production parts of electronic, semiconductor, display, micro-electromechanical system, hard disk and nanotechnology processes, the method comprising the steps of:
 - a) measuring a plurality of process conditions for defect inspection equipment using a plurality of analyses of at least one region of interest and providing a plurality of signals representing one or more defects within said at least one region of interest;
 - b) processing said plurality of signals to determine the nature and presence of said one or more defects in said at least one region of interest; and
 - c) processing said plurality of signals using a rule-based logic system to classify defects within said at least one region of interest.